

DETAILED ACTION

1. The Art Unit location of your application in the USPTO has changed. To aid in correlating any papers for this application, all further correspondence regarding this application should be directed to Art Unit 2614.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. **Claims 1-9, and 11-19** are rejected under 35 U.S.C. 102(b) as being anticipated by Aarts et al. U.S. Patent 6,111,960 (hereinafter, "Aarts").

Regarding **claim 1**, Aarts teaches an acoustic signal-processing apparatus (see Fig. 9 and respective portions of the specification, col. 9 lines 15-21) comprising:

a band-dividing unit (band-pass filters 20A-20N; Fig.9) operable to divide a low frequency component in an entering acoustic signal into filtered components that belong to several frequency bands (col. 9 lines 15-21);

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a formational condition-establishing unit (zero-crossing detector 240, Fig. 5) operable to establish a formational condition in such a manner that a plurality of overtone components to be generated meet a given condition (to generate harmonics on the basis of the detected zero crossings, with fixed amplitudes, col. 3, lines 12-18; col. 7, lines 3-8);

an overtone-generating unit (harmonic generators 23A-23N; Fig. 9) operable to generate, according to the established formational condition (i.e., at zero-crossing), the plurality of overtone components (i.e., harmonics) based on each of the filtered components that belong to the several frequency bands (col. 9 lines 15-21); and

a combining unit (sum 26, Fig. 9) operable to combine the entering acoustic signal with the plurality of overtone components generated by said overtone-generating unit (col. 10, lines 30-40).

Aarts thus teaches all the claimed limitations.

Regarding **claim 2**, Aarts teaches an acoustic signal-processing apparatus as defined in claim 1, wherein the established formational condition (zero-crossing, col. 3, lines 12-18; col. 7, lines 3-8) is concerned with a degree of each of the plurality of overtone components (i.e., harmonics) generated by said overtone-generating unit (i.e., harmonic order; second, third harmonic; col. 5, lines 41-51).

Regarding **claim 3**, Aarts teaches an acoustic signal-processing apparatus as defined in claim 1, wherein the established formational condition (zero-crossing, col. 3, lines 12-18; col. 7, lines 3-8) defines that the plurality of overtone components generated by said overtone-generating unit fall within a range of a given frequency (based on harmonic generators 23A-23N; Fig. 9).

Regarding **claim 4**, Aarts teaches an acoustic signal-processing apparatus as defined in claim 1, wherein said overtone-generating unit (harmonic generators 23A-23N; Fig. 9) generates one or more overtone components based on each of the filtered components that belong to the several frequency bands (based on harmonic generators 23A-23N; Fig. 9); and wherein the established formational condition (zero-crossing, col. 3, lines 12-18; col. 7, lines 3-8 to have harmonic order; second, third harmonic; col. 5, lines 41-51) defines that a number of the one or more overtone components generated based on a filtered component that belongs to a higher frequency band among the several frequency bands (i.e., of input band-pass filters 20A-20N; Fig. 9) is not greater than a number of the one or more overtone components generated based on a filtered component that belongs to a lower frequency band among the several frequency bands (by selecting frequency band being lower than the highest signal frequencies of the audio input signal; harmonics generator means for generating harmonics of signals in the selected frequency band of the audio input signal to provide generated harmonics col. 12, lines 36-40). For further

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clarification it is noted that the reason is the frequency bands are small frequency bands, see col. 9, lines 17-21.

Regarding **claim 5**, Aarts teaches an acoustic signal-processing apparatus as defined in claim 1, wherein the established formational condition (zero-crossing, col. 3, lines 12-18; col. 7, lines 3-8, to have harmonic order; second, third harmonic; col. 5, lines 41-51) defines generation of the plurality of overtone components for each of the several frequency bands (based on harmonic generators 23A-23N; Fig. 9), the plurality of overtone components having at least one of a reachable least degree and an degree greater than the reachable least degree (harmonic order, col. 5, lines 41-51), the reachable least degree being a least degree that reaches an envisaged speaker reproducible band (in low frequency for low-frequency perception; col. 4, line 65 - col. 5, line 4).

Regarding **claim 6**, Aarts teaches an acoustic signal-processing apparatus as defined in claim 1, wherein the established formational condition (zero-crossing, col. 3, lines 12-18; col. 7, lines 3-8, generating wave form at zero-crossing) defines that the plurality of overtone components generated by said overtone-generating unit (harmonic order; second, third harmonic; col. 5, lines 41-51) fall within a range of a given frequency (in low frequency for low-frequency perception; col. 4, line 65 - col. 5, line 4), and defines that the plurality of overtone components have a reachable least degree and a degree that is

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greater than the reachable least degree but falls within the range of the given frequency (i.e., assigning separate harmonics generators to each band will substantially prevent such intermodulation from taking place; col. 9, lines 23-40), the reachable least degree being a least degree that reaches an envisaged speaker reproducible band (in low frequency; e.g., 120Hz; col. 9, lines 23-40).

Regarding **claim 7**, Aarts teaches an acoustic signal-processing apparatus as defined in claim 1, wherein the (zero-crossing, col. 3, lines 12-18; col. 7, lines 3-8, generating wave form at zero-crossing) defines that the plurality of overtone components generated by said overtone-generating unit (harmonic order; second, third harmonic; col. 5, lines 41-51) fall within a range of a given frequency (in low frequency; e.g., 120Hz; col. 9, lines 23-40), and that only the plurality of overtone components (i.e., harmonics) having a single degree (i.e., harmonic order) for each of the several frequency bands are generated (prevent such intermodulation from taking place; col. 9, lines 23-40). For further clarification it is noted that the reason is the frequency bands are small frequency bands, see col. 9, lines 17-21.

Regarding **claim 8**, Aarts teaches an acoustic signal-processing apparatus as defined in claim 7, wherein the single degree (i.e., harmonic order) is a reachable least degree, the reachable least degree being a least degree that reaches an envisaged speaker reproducible band (in low frequency; e.g., 120Hz;

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col. 9, lines 23-40). For further clarification it is noted that the reason is the frequency bands are small frequency bands, see col. 9, lines 17-21.

Regarding **claim 9**, Aarts teaches an acoustic signal-processing apparatus as defined in claim 7, wherein the single degree (i.e., harmonic order) is set in such a manner that the plurality of overtone components (i.e., harmonic) generated based on the filtered components that belong to the several frequency bands have frequencies non-overlapped with each other (i.e., assigning separate harmonics generators to each band will substantially prevent such intermodulation from taking place; col. 9, lines 23-40). For further clarification it is noted that the reason is the frequency bands are small frequency bands, see col. 9, lines 17-21.

Regarding **claims 11-19**, these claims merely reflect the method to the apparatus claim of claims 1-9 and are therefore rejected for the same reasons.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claims 10 and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Aarts et al. U.S. Patent 6,111,960 (hereinafter, "Aarts") in view of Case U.S. Patent 6,335,973.

Regarding **claim 10**, Aarts teaches an acoustic signal-processing apparatus as defined in claim 1. Aarts discloses if more or less harmonics are required, the number of multipliers and coefficients can be increased or decreased; making the coefficients C1-C5 adjustable (col. 6, lines 35-45).

Aarts does not explicitly disclose wherein each of the plurality of overtone components has amplitude set to decrease with an increase in frequency.

Case discloses an harmonic enhancement system (col. 1, lines 52-55) in which each of the plurality of overtone components have amplitude set to decrease with an increase in frequency (see Fig. 15b; col. 6, lines 1-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the an harmonic enhancement system taught by Case with the acoustic signal-processing apparatus of Aarts such that wherein each of the plurality of overtone components have amplitude set to decrease with an increase in frequency as claimed for purpose of improving audio clarity, as suggested by Case in column 1, lines 59-60.

Regarding **claim 20**, this claim merely reflects the method to the apparatus claim of claim 11 and is therefore rejected for the same reasons.

Response to Arguments

6. Applicants' arguments filed July 1, 2008 have been fully considered but they are not persuasive. It is noted that, as presented above in the Office Action, Aarts discloses a formational condition-establishing unit (zero-crossing detector 240, Fig. 5) operable to establish a formational condition in such a manner that a plurality of overtone components to be generated meet a given condition (to generate harmonics on the basis of the detected zero crossings, with fixed amplitudes, col. 3, lines 12-18; col. 7, lines 3-8).

Regarding Applicants' arguments of Claims 4, 7, 8, 9, for further clarification it is noted that the since the frequency bands are small frequency bands, see col. 9, lines 17-21 in which single degree harmonic is generated, i.e., no greater.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened

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statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action. Any inquiry concerning this communication or earlier communications from the examiner should be directed to CON P. TRAN whose telephone number is (571)272-7532. The examiner can normally be reached on M - F (08:30 AM - 05:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor VIVIAN C. CHIN can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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/Vivian Chin/

Supervisory Patent Examiner, Art Unit 2615